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METHOD AND APPARATUS FOR INSURING DELIVERY OF ELECTRONIC DOCUMENTS IN A NETWORK DATA PROCESSING SYSTEM

BACKGROUND OF THE INVENTION

1. Technical Field:

5   The present invention relates generally to an improved data processing system and in particular to a method and apparatus for transferring data. Still more particularly, the present invention provides a method, apparatus, and computer implementable instructions for

10   insuring delivery of electronic documents in a network data processing system.

2. Description of Related Art:

The Internet, also referred to as an "internetwork", is a set of computer networks, possibly dissimilar, joined

15   together by means of gateways that handle data transfer and the conversion of messages from a protocol of the sending network to a protocol used by the receiving network. When capitalized, the term "Internet" refers to the collection of networks and gateways that use the

20   TCP/IP suite of protocols.

The Internet has become a cultural fixture as a source of both information and entertainment. Many businesses are creating Internet sites as an integral part of their marketing efforts, informing consumers of the

25   products or services offered by the business or providing other information seeking to engender brand loyalty. Many federal, state, and local government agencies are also employing Internet sites for informational purposes, particularly agencies which must interact with virtually

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all segments of society such as the Internal Revenue
Service and secretaries of state. Providing informational
guides and/or searchable databases of online public
records may reduce operating costs. Further, the Internet
5   is becoming increasingly popular as a medium for
commercial transactions.

Currently, the most commonly employed method of
transferring data over the Internet is to employ the World
Wide Web environment, also called simply "the Web". Other
10 Internet resources exist for transferring information,
such as File Transfer Protocol (FTP) and Gopher, but have
not achieved the popularity of the Web. In the Web
environment, servers and clients effect data transaction
using the Hypertext Transfer Protocol (HTTP), a known
15 protocol for handling the transfer of various data files
(e.g., text, still graphic images, audio, motion video,
etc.). The information in various data files is
formatted for presentation to a user by a standard page
description language, the Hypertext Markup Language
20 (HTML). In addition to basic presentation formatting,
HTML allows developers to specify "links" to other Web
resources identified by a Uniform Resource Locator (URL).
A URL is a special syntax identifier defining a
communications path to specific information. Each logical
25 block of information accessible to a client, called a
"page" or a "Web page", is identified by a URL. The URL
provides a universal, consistent method for finding and
accessing this information, not necessarily for the user,
but mostly for the user's Web "browser". A browser is a
30 program capable of submitting a request for information
identified by an identifier, such as, for example, a URL.
A user may enter a domain name through a graphical user

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interface (GUI) for the browser to access a source of content. The domain name is automatically converted to the Internet Protocol (IP) address by a domain name system (DNS), which is a service that translates the symbolic

5   name entered by the user into an IP address by looking up the domain name in a database.

The Internet also is widely used to transfer applications to users using browsers. With respect to commerce on the Web, individual consumers and businesses

10   use the Web to purchase various goods and services. In offering goods and services, some companies offer goods and services solely on the Web while others use the Web to extend their reach. Many uses have been made of the Internet.

15   For example, good and services may be purchased on the Internet. Further, electronic mail or "e-mail" is common place and is taking over the role that physical mail once had in personal and business uses. E-mail and other types of electronic documents form one of the most

20   important aspects of commerce on the electronic commerce as well as for other purposes. With heavier reliance on the Internet to send and transmit documents that were normally sent as physical documents by mail, overnight delivery services, and facsimile, the timely delivery of

25   documents is just as important with delivery of documents using the Internet. The timely delivery of documents or other data is mission critical for many businesses to be successful. This situation is especially true for real time data that needs to be delivered by specific

30   deadlines to be of any use to the recipient. Examples of critical real time data include, for example, electronic tax returns, payments for property bills, and bids on

contracts. Delays are unacceptable in some instances. There is a need and a desire to protect businesses against delays that may occur.

5   Therefore, it would be advantageous to have an improved method, apparatus, and computer implementable instructions for protecting an entity against damages that may occur with an untimely delivery of data.

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SUMMARY OF THE INVENTION

The present invention provides for a method, apparatus, and computer implementable instructions for insuring delivery of an electronic document in a data

5   processing system. A request is received from a requestor to insure delivery of the electronic document. In response to receiving the request, a payment amount to insure delivery is identified based on network characteristics of a network in which the electronic

10   document is to be transmitted. An acknowledgment of the electronic document is sent to the requestor, wherein the acknowledgment includes the identification of the payment amount. The electronic document is delivered in response to receiving a reply to the acknowledgment from the

15   requestor accepting the payment amount. The requestor is notified of a successful delivery of the electronic document in response to receiving an acknowledgment from the recipient.

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BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself, however, as well as a preferred mode of
5   use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

Figure 1 is a pictorial representation of a network
10   of data processing systems in which the present invention may be implemented;

Figure 2 is a block diagram of a data processing system that may be implemented as a server in accordance with a preferred embodiment of the present invention;

15   **Figure 3** is a block diagram illustrating a data processing system in which the present invention may be implemented;

Figure 4 is a block diagram of components used in insuring delivery of data in accordance with a preferred
20   embodiment of the present invention;

Figure 5 is a flowchart of a process used for requesting insurance for timely delivery of data in accordance with a preferred embodiment of the present invention;

25   **Figure 6** is a flowchart of a process used for processing requests for insuring timely delivery of data in accordance with a preferred embodiment of the present invention;

Figure 7 is a flowchart of a process used for
30   confirming delivery of an e-mail message in accordance with a preferred embodiment of the present invention; and

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Figure 8 is a block diagram of components used in insuring delivery of data in accordance with an alternative embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the figures, **Figure 1** depicts a pictorial representation of a network of data processing systems in which the present invention may be implemented.

5 Network data processing system **100** is a network of computers in which the present invention may be implemented. Network data processing system **100** contains a network **102**, which is the medium used to provide communications links between various devices and computers

10 connected together within network data processing system **100**. Network **102** may include connections, such as wire, wireless communication links, or fiber optic cables. In the depicted example, server **104** is connected to network **102** along with storage unit **106**. In addition,

15 clients **108**, **110**, and **112** are connected to network **102**. These clients **108**, **110**, and **112** may be, for example, personal computers or network computers. In the depicted example, server **104** provides data, such as boot files, operating system images, and applications to clients

20 **108-112**. Clients **108**, **110**, and **112** are clients to server **104**. Network data processing system **100** may include additional servers, clients, and other devices not shown.

In these, examples, server **104** may serve as an insurance server to insure the deliver of data within

25 network **102**. Clients, such as clients **108**, **110**, and **112**, may request that data, such as electronic documents, e-mail, or real time data, be insured in the instance that the data is not delivered by a requested time. Server **104**

may be provided a location for receiving the data and
sending the data to the destination. Also, server **104** may
evaluate the data and network characteristics with respect
to the destination to identify when delivery can be

5   guaranteed. Insurance is issued with a value agreed to by
the insuring party and the sender of the data in case the
data is delivered in an untimely manner.

In the depicted example, network data processing
system **100** is the Internet with network **102** representing a

10 worldwide collection of networks and gateways that use the
TCP/IP suite of protocols to communicate with one another.
At the heart of the Internet is a backbone of high-speed
data communication lines between major nodes or host
computers, consisting of thousands of commercial,

15 government, educational and other computer systems that
route data and messages. Of course, network data
processing system **100** also may be implemented as a number
of different types of networks, such as for example, an
intranet, a local area network (LAN), or a wide area

20 network (WAN). **Figure 1** is intended as an example, and not
as an architectural limitation for the present invention.
Referring to **Figure 2**, a block diagram of a data
processing system that may be implemented as a server,
such as server **104** in **Figure 1**, is depicted in accordance

25 with a preferred embodiment of the present invention.

Data processing system **200** may be implemented as an
insurance server to receive data for delivery to
destinations for clients who have insured the delivery of
this data. Further, data processing system **200** also may

30 be used to determine when data can be delivered and
provide terms for insurance for the delivery of the data.
Data processing system **200** may be a symmetric

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multiprocessor (SMP) system including a plurality of

processors **202** and **204** connected to system bus **206**.

Alternatively, a single processor system may be employed.

Also connected to system bus **206** is memory

5   controller/cache **208**, which provides an interface to local

memory **209**.   I/O bus bridge **210** is connected to system bus

206 and provides an interface to I/O bus **212**.   Memory

controller/cache **208** and I/O bus bridge **210** may be

integrated as depicted.

10   Peripheral component interconnect (PCI) bus bridge

214 connected to I/O bus **212** provides an interface to PCI

local bus **216**.   A number of modems may be connected to PCI

local bus **216**.   Typical PCI bus implementations will

support four PCI expansion slots or add-in connectors.

15   Communications links to clients **108-112** in **Figure 1** may be

provided through modem **218** and network adapter **220**

connected to PCI local bus **216** through add-in boards.

Additional PCI bus bridges **222** and **224** provide interfaces

for additional PCI local buses **226** and **228**, from which

20   additional modems or network adapters may be supported.

In this manner, data processing system **200** allows

connections to multiple network computers.   A

memory-mapped graphics adapter **230** and hard disk **232** may

also be connected to I/O bus **212** as depicted, either

25   directly or indirectly.

Those of ordinary skill in the art will appreciate

that the hardware depicted in **Figure 2** may vary.   For

example, other peripheral devices, such as optical disk

drives and the like, also may be used in addition to or in

30   place of the hardware depicted.   The depicted example is

not meant to imply architectural limitations with respect

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to the present invention.

The data processing system depicted in **Figure 2** may be, for example, an IBM e-Server pSeries system, a product of International Business Machines Corporation in Armonk, New York, running the Advanced Interactive Executive (AIX) operating system or LINUX operating system.

With reference now to **Figure 3**, a block diagram illustrating a data processing system is depicted in which the present invention may be implemented. Data processing system **300** is an example of a client computer. A user at client computer **300** may desire to obtain protection against damages that may occur if data, such as e-mail, real time data, or an electronic document, is delivered in an untimely manner. The user sends the data to an insurance entity, such as an insurance server. The user also may transmit a value of the data with the data. A response with terms of the insurance is received indicating when the data can be delivered for the insured amount. By accepting the terms, the data is now insured. Of course the terms of insurance and the premium paid may be arranged ahead of time, especially in cases in which data is sent on a regular basis.

Data processing system **300** employs a peripheral component interconnect (PCI) local bus architecture. Although the depicted example employs a PCI bus, other bus architectures such as Accelerated Graphics Port (AGP) and Industry Standard Architecture (ISA) may be used. Processor **302** and main memory **304** are connected to PCI local bus **306** through PCI bridge **308**. PCI bridge **308** also may include an integrated memory controller and cache memory for processor **302**. Additional connections to PCI

local bus **306** may be made through direct component
interconnection or through add-in boards. In the depicted
example, local area network (LAN) adapter **310**, SCSI host
bus adapter **312**, and expansion bus interface **314** are

5   connected to PCI local bus **306** by direct component
connection. In contrast, audio adapter **316**, graphics
adapter **318**, and audio/video adapter **319** are connected to
PCI local bus **306** by add-in boards inserted into expansion
slots. Expansion bus interface **314** provides a connection

10 for a keyboard and mouse adapter **320**, modem **322**, and
additional memory **324**. Small computer system interface
(SCSI) host bus adapter **312** provides a connection for hard
disk drive **326**, tape drive **328**, and CD-ROM drive **330**.
Typical PCI local bus implementations will support three

15 or four PCI expansion slots or add-in connectors.
An operating system runs on processor **302** and is used to
coordinate and provide control of various components
within data processing system **300** in **Figure 3**. The
operating system may be a commercially available operating

20 system, such as Windows 2000, which is available from
Microsoft Corporation. An object oriented programming
system such as Java may run in conjunction with the
operating system and provide calls to the operating system
from Java programs or applications executing on data

25 processing system **300**. "Java" is a trademark of Sun
Microsystems, Inc. Instructions for the operating system,
the object-oriented operating system, and applications or
programs are located on storage devices, such as hard disk
drive **326**, and may be loaded into main memory **304** for

30 execution by processor **302**.
        Those of ordinary skill in the art will appreciate

that the hardware in **Figure 3** may vary depending on the implementation. Other internal hardware or peripheral devices, such as flash ROM (or equivalent nonvolatile memory) or optical disk drives and the like, may be used

5 in addition to or in place of the hardware depicted in **Figure 3**. Also, the processes of the present invention may be applied to a multiprocessor data processing system.

As another example, data processing system **300** may

10 be a stand-alone system configured to be bootable without relying on some type of network communication interface, whether or not data processing system **300** comprises some type of network communication interface. As a further example, data processing system **300** may be a Personal

15 Digital Assistant (PDA) device, which is configured with ROM and/or flash ROM in order to provide nonvolatile memory for storing operating system files and/or user-generated data.

The depicted example in **Figure 3** and above-described

20 examples are not meant to imply architectural limitations. For example, data processing system **300** also may be a notebook computer or hand held computer in addition to taking the form of a PDA. Data processing system **300** also may be a kiosk or a Web appliance.

25 Turning now to **Figure 4**, a block diagram of components used in insuring delivery of data is depicted in accordance with a preferred embodiment of the present invention. In this example, client **400** sends e-mail and electronic documents to various recipients using e-mail

30 program **402**. Client **400** may be implemented using data processing system **300** in **Figure 3**. In this example, e-mail message **404** is sent to server **406**, which may be

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implemented using data processing system **200** in **Figure 2**.

Server **406** receives e-mail message **404** at Web server **408**, which serves to process requests received on the Internet. Web server **408** sends e-mail message **404** to insurance server **410** for processing. In this example, e-mail message **404** may include a value of the e-mail and/or any attachments, such as a legal document, scientific data, or images. The destination for e-mail message **404** is identified and network characteristics are examined and analyzed using information from network database **412**. In this example, the destination is recipient **414**. These network characteristics include, for example, network traffic characteristics, network congestion, reliability of network properties, and statistical transmission times to the destination. Tools are available, such as "pchar" that characterize the band width latency and loss of links along an end to end path through the Internet. The pchar tool is a reimplementation of the pathchar utility, written by Van Jacobson. This type of tool was first produced at Sandia National Laboratories. Another tool called "skitter" actively probes the Internet in order to analyze topology and performance. Skitter is a tool available from Cooperative Association for Internet Data Analysis (CAIDA). The characteristics stored in network database **412** may be obtained from various sources and using various available metrics programs. E-mail message **404** also may be analyzed to determine a delivery time. The size of e-mail message **404** as well as the content may be used in this analysis. Based on this analysis, insurance server **410** identifies an amount of time in which e-mail

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message **404** can be delivered to recipient **414**.

E-mail message **404** also may include a value of the
document or an amount of insurance desired, in case the
document is delivered in an untimely manner. Based on
5   the value identified, a premium or cost of the insurance
may be set. Further, this premium or cost may be
identified using other characteristics, such as, for
example, the number of characters or pages in e-mail
message **404**, a geographic location of recipient **414**, the
10   time of delivery, and other contents of the delivery,
such as attachments.

Insurance server **410** returns acknowledgment **416** to
client **400** through Web server **408**. In this example, the
acknowledgment includes an indication of receipt of
15   e-mail message **404**, the destination address, a cost of
insurance, and an estimated time to deliver to the
destination. If the user agrees to these terms and the
delivery time is acceptable, acceptance **418** is sent back
to insurance server **410**. Upon receiving the acceptance,
20   insurance server **410** sends e-mail message **404** to
recipient **414**. In addition, the user is billed for the
insurance using user database **420**. User database **420**
contains information, such as an identification of
customers or users and the terms of insurance associated
25   with these customers or users. In these examples, if an
acknowledgment of the receipt of e-mail message **404** is
not received from recipient **414** by a selected amount of
time, insurance server **410** resends e-mail message **404** to
recipient **414** either through the same route or another
30   route.

Upon receiving acknowledgment of the receipt of

e-mail message **404** from recipient **414**, acknowledgment **422** is sent to client **400** indicating a successful delivery of e-mail message **404**. If e-mail message **404** is delivered in an untimely manner, then details of the delivery may

5   be sent. These details may include, for example, the actual time of delivery or the identification of traffic problems. In this instance, a payment is made to client **400**. This payment for the untimely delivery is entered into user database **420** in this example.

10   In the depicted examples, the data illustrated is in the form of an e-mail message and any attachments to the message. The mechanism of the present invention also may be applied to other types of data, such as the transmission of real time data. Further, the terms of

15 insurance for the transmission of data may be arranged prior to receiving the data depending on the particular implementation. Further, the example in **Figure 4** depicts components to explain the functional features of one embodiment of the present invention and is not meant to

20 limit the manner in which these features may be implemented. For example, user database **420** and network database **412** do not necessarily need to be located within server **406**. Instead, they may be located in other machines depending on the particular implementation.

25   With reference now to **Figure 5**, a flowchart of a process used for requesting insurance for timely delivery of data is depicted in accordance with a preferred embodiment of the present invention. The process illustrated in **Figure 5** may be implemented as

30 instructions for a computer program in a client, such as client **400** in **Figure 4**.

The process begins by transmitting an e-mail message

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to an insurance server with a value for the e-mail message (step **500**). An acknowledgment is received (step **502**). This acknowledgment includes terms for insuring the delivery of the e-mail message. These terms include,

5   for example, a time by which the e-mail message can be delivered and a payment amount for the insurance. A determination is then made as to whether the terms are acceptable to the user (step **504**). If the terms are acceptable, an acceptance of the terms is sent to the

10   insurance server (step **506**) with the process terminating thereafter. If the terms are not acceptable, a message declining the insurance is sent to the insurance server (step **508**) and the process terminates thereafter.

With reference now to **Figure 6**, a flowchart of a

15   process used for processing requests for insuring timely delivery of data is depicted in accordance with a preferred embodiment of the present invention. The process illustrated in **Figure 6** may be implemented as instructions for a computer program in a server, such as

20   server **406** in **Figure 4**.

The process begins by receiving an e-mail message from a sender (step **600**). Next, a value of the e-mail message is identified (step **602**). The value of the e-mail message to be sent is identified within the e-mail

25   message or in an attachment to the e-mail message in this example. A determination is made as to whether the value is within a threshold (step **604**). In some cases, the value requested may be high enough that insurance will not be provided for the e-mail message. If the value is

30   within the threshold, a determination is then made as to whether the e-mail message contains attachments (step **606**). These attachments may be, for example, a word

processing document, scientific data, images, or audio data. If the e-mail message does not contain attachments, the size of the e-mail message is identified (step **608**). Then, a destination is identified (step

5 **610**).

Network characteristics are identified using the destination (step **612**). In step **612**, these network characteristics are those associated with different routes to the destination. An insurance payment is

10 calculated based on the characteristic identifications (step **614**), and an acknowledgment is sent to the sender (step **616**). A determination is made as to whether an acceptance by the sender is received (step **618**). If an acceptance is received, the sender is billed (step **620**).

15 In step **620**, the billing of a user is made through a database, such as user database **420** in **Figure 4**. An e-mail message is transmitted to the recipient of the insurance (step **622**) with the process terminating thereafter.

20 Turning back to step **618**, if an acceptance is not received, the process terminates. With reference again to step **606**, if the e-mail message contains attachments, the attachment characteristics are identified (step **624**) and the process proceeds to step **608** as described above.

25 Turning back to step **604**, if the value of the e-mail message is not within the threshold, a message declining to provide insurance is sent (step **626**) and the process terminates.

With reference now to **Figure 7**, a flowchart of a

30 process used for confirming delivery of an e-mail message is depicted in accordance with a preferred embodiment of

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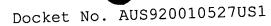the present invention. The process illustrated in **Figure 7** may be implemented as instructions for a computer program in a server, such as server **406** in **Figure 4**.

The process begins by receiving a confirmation of an

5 e-mail message delivery (step **700**). Next, a determination is made as to whether the delivery was made within the promised delivery time (step **702**). This determination is made by comparing the actual delivery time with the delivery time set in the terms of the

10 insurance for the document. The terms may be found in a database, such as user database **420** in **Figure 4**. If the delivery is not made by the promised or guaranteed time, then a payment is sent to the requestor (step **704**) with the process terminating thereafter. This payment is set

15 by the terms of the insurance. Otherwise, a confirmation of the successful delivery is sent to the user (step **706**) with the process terminating thereafter.

One of ordinary skill in the art will recognize that the present invention is not limited in scope to the

20 above-described preferred embodiment; the present invention encompasses many variations. For example, in one alternate embodiment, the amount a sender pays for the insurance increases as the number of times the sender is compensated for untimely message deliveries. This is

25 analogous to the way in which automobile insurance works, where drivers who file many claims pay higher premiums.

The block diagram in **Figure 8** depicts yet another variation on the present invention. The alternative embodiment in **Figure 8** places the responsibility for

30 delivering the electronic mail message on the client, rather than on the server as in **Figure 4**.

Client **800** has an electronic mail program **802**

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installed. To send an insured electronic mail message with electronic mail program **802**, client **800** issues a request (**804**) to server **806** to register for insurance services. Client **800** then downloads (**808**) tracking

5 software **810** from server **806**. Tracking software **810** is then installed on client **800**. Tracking software **810** keeps a history log reflecting when and to whom electronic mail messages are sent and successfully delivered.

10 E-mail program **802** sends electronic mail message **812** to recipient **814**. Tracking software **810** keeps track of when electronic mail message **812** was sent and successfully delivered to recipient **814**. At some point, server **806** issues a request (**816**) to client **800** to

15 receive the history log information recorded by tracking software **810**. Client **800** then transmits the history log information (**818**) to server **806** for recording and so that the client may be compensated if the delivery was untimely or incomplete.

20 Thus, the present invention provides an improved method, apparatus, and computer implementable instructions for reducing damages incurred by untimely delivery of data. The mechanism of the present invention provides for document delivery in which the delivery of

25 data, such as electronic documents, images, or other data, is insured against untimely delivery.

It is important to note that while the present invention has been described in the context of a fully functioning data processing system, those of ordinary

30 skill in the art will appreciate that the processes of the present invention are capable of being distributed in the form of a computer readable medium of instructions

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and in a variety of forms and that the present invention applies equally regardless of the particular type of signal bearing media actually used to carry out the distribution. Examples of computer readable media

5 include recordable-type media, such as a floppy disk, a hard disk drive, a RAM, CD-ROMs, DVD-ROMs, and transmission-type media, such as digital and analog communications links, wired or wireless communications links using transmission forms, such as, for example,

10 radio frequency and light wave transmissions. The computer readable media may take the form of coded formats that are decoded for actual use in a particular data processing system.

The description of the present invention has been

15 presented for purposes of illustration and description, and is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art. The embodiment was chosen and described in

20 order to best explain the principles of the invention, the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.